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A REMARKABLE OCCURRENCE OF THE FLY,
BIBIO FRATERNUS LOEW.

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Not far from my home in Lake Forest there is a forty-acre patch of woodland pasture that has been enclosed but not grazed for a number of years. It has become well overgrown with a thick blue-grass sod. Save for a few young hawthorns in scattered clumps, there is no underbrush. The open wood consists mainly of white oaks. Black oaks were originally abundant but have been cut down, and now the sod is thickly dotted with their rotting stumps. Around the bases of these stumps, where the sod closely enwraps them, is the larval home of *Bibio fraternus*.

I had seen but few specimens of this fly until the spring of 1901, and was wholly unacquainted with its immature stages and with its larval habitat. It chanced that on walking across this pasture in April I kicked over a rotten stump, and, where a lateral root pulled out from under the sod, there in the fine black soil that had resulted from the complete decomposition of the bark were a large number of dipterous larvæ, which later, when reared, yielded imagoes of this species.

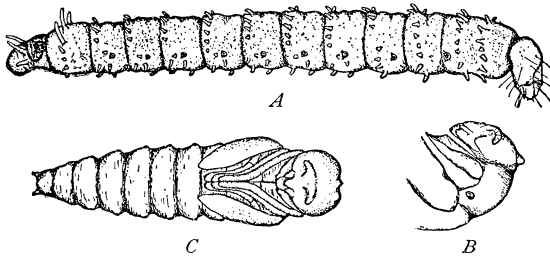
Nothing appears to have been written of the species since Loew penned the original description. In fact, the immature stages seem not to have been described or figured for any American species of the family Bibionidæ. Mr. D. W. Coquillett, who determined my imagoes for me, having assured me that under the existing circumstances even a slight contribution to the knowledge of these things would be welcomed by dipterologists, I offer herewith some observations on the habits of this species and a description of its immature stages.

Habits.—My acquaintance with the habits of the species began as indicated above. On May 5 I collected a large number of grown larvæ and a few pupæ about different stumps and placed them, with a quantity of their native soil, in a breeding cage. Imagoes began to appear on the 13th and continued transforming until the 20th. On the 18th, when my cage was full of fresh imagoes, I went out to the pasture but could find none there. In the earth were plenty of pupæ, but no more larvæ. Perhaps the development of those in my cage was hastened by the higher temperature of the laboratory in which they were kept. About May 22 the first few imagoes were observed at large. On the 24th I discovered, on walking across the pasture, that the grass was full of them. A score could be swept up at each stroke of the net; but none were flying, for the air was chill. On the 26th, 28th, and 30th, visiting the pasture again I saw the great swarms of them which I now come to describe.

I was not prepared for any exhibition of aërial activity by what I had seen in my breeding cage. There the imagoes seemed hardly able to walk, to say nothing of flying. They were very sluggish; they climbed the sides of the cage weakly, and tumbled about even in walking, and were handled without any thought of their getting away. Even in the field on the 24th I had picked them up with my fingers and examined them unconfined under a lens. But on these three later days warm sunshine had stirred them to unexpected activity. They were flying in countless numbers in the more sheltered places in the woods and were actively climbing about in the branches of the opening blue-grass panicles or resting in pairs on the

leaves. The flight of the males is long sustained. Both males and females, and especially the latter, have some difficulty in getting launched. They climb to a leaf top, balance carefully, stretch their wings and try them before letting go, and finally swing free into the air.

I have rarely come upon a scene of greater animation than a sheltered hollow in this wood presented. There was the undulating field, clad in waving grass and set about with the pale-hued springtime foliage of the white oaks; there were the flowering hawthorns; and there were the myriads of *Bibios* floating in the sunshine, streaming here and there like chaff before sudden gusts and swirls of air. All the spiders' webs



A, larva of *Bibio fraternus* Loew., lateral view. *B*, lateral view of head of female pupa. *C*, ventral view of male pupa.

in the bushes were filled with captives; little groups of ants were dragging single flies away to their nests, and once I saw overhead a chestnut-sided warbler, perched on a bare bough directly in a stream of passing flies, rapidly pecking to right and to left, persistently stuffing his already rotund maw.

I stood in one spot and swept the air with my net for half a minute and obtained 128 male *Bibios* and 5 females: ratio, 25: 1. I swept the grass a few times with my net and thus obtained 127 males and 372 females: ratio, 1: 2.2. The discrepancy of ratios is due to the fact that a comparatively small proportion of the flies were in the air. I counted a number of flies I could see resting on the grass in several small areas wide apart and found the counts averaged 15 *Bibios* per square foot; and there were here in one place forty acres of such *Bibio* territory.¹ There can

¹ Professor Herbert Osborn notes the occurrence of *Bibio albipennis* in phenomenal numbers in Iowa, in *Insect Life*, vol. iii (1891), p. 479.

be no doubt that this obscure and little-known fly is a factor of considerable importance in the ecology of such a situation.

Immature Stages. — I now describe the larva and the pupa, and accompany the descriptions with drawings by Miss Maude H. Anthony.

Larva. — Length 13–14 mm. ; diameter 1.5 mm. Body cylindric as far as the 9th abdominal segment, or with slightly greater depth in the thorax ; head well developed, exerted, about equal in length to the body segments, except the first, which is a third longer than the others ; there is a distinct Y-shaped suture on the top of the head ; a pair of setæ are inserted just before and another pair just behind the clypeal suture ; eyes wanting ; four setæ on the epicranium each side, — two at the edge and one above and one below ; there are lesser setæ on the maxillæ externally. The laciniae of the maxillæ and the mandibles are elongate pyramidal, with low teeth on their truncated apices. There are two pairs of thoracic and eight pairs of abdominal spiracles : the foremost is situated at the rear of the prothorax and is larger than those following, except the last ; the second pair is at the front margin of the metathorax ; the next seven pairs are just before the middle of abdominal segments 1–7 ; those of the 9th abdominal segment are very large and each is divided by a median groove. Each of the middle body segments is completely encircled by a row of about a dozen tubercles, which is slightly oblique upon the sides and in which the dorsal tubercles are usually longer than the ventral, and there are a few tubercles out of line at the sides in the vicinity of the spiracle ; on the 1st segment behind the head there is another row of eight tubercles, on the dorsum between the spiracles, and on this segment the tubercles are all longest at the sides ; on segment 8 of the abdomen the dorsal tubercles are more elongate and the ventral ones more reduced ; segment 9 is depressed conic, tapering posteriorly, with the large spiracles inserted in anterior emarginations of a brownish, chitinous, saddle-shaped plate, which covers most of the dorsum of the segment ; behind this plate arise two pairs of filaments (elongate tubercles), the median pair as long as the segment is thick, the external pair a third shorter.

Skin granulate, closely invested with adherent dirt particles.

Pupa. — Length 7.5 mm. ; breadth of thorax 2.1 mm., of abdomen 1.5 mm. Body smooth, whitish, with low appressed head, short, thick thorax, and straight abdomen whose sides are parallel except at its abruptly tapering apex.

Head flat, with short antenna cases which extend hardly more than halfway across the eyes, with well-marked paired jaw cases, and with an ocellar tubercle at the rear of the head above, low in the male, high and prominent in the female (owing to slight development of the compound eyes).

Prothoracic spiracles low, not elevated above the thoracic dorsum ; no respiratory horns or trumpets.

Ninth abdominal segment terminating on the dorsal side in a pair of stout divergent triangular processes, that are about as long as the segment which bears them.

The rather generalized larva is characterized by an unusually well-developed head, simple mouth parts, rings of tubercles on all the segments, those of the two hindmost segments elongate, becoming filaments, showing out of what material the borders of the tipulid caudal respiratory disk have been made. The pupa is characterized by the unusual brevity of the antenna cases, which reach but halfway across the eyes, distinctly paired jaws, low prothoracic spiracles without respiratory trumpets, horns, or tubes, and a naked, spineless skin.